IN THE SPECIFICATION:

Please amend the specification as shown below, in which deleted terms are shown with strikethrough and/or double brackets, and added terms are shown with underscoring.

Paragraph [001] This invention relates to an electronic key system for a vehicle wherein radio communication is performed between a transmitter/receiver (electronic key) carried by a user and a control apparatus mounted on an actual vehicle to verify an ID and, if a ~~request~~ communication received originates from a legal or proper user, then starting of an engine or some other action is performed[[,]]. ~~and more~~ More particularly, this invention relates to an electronic key system for a vehicle suitable for use with, for example, a motorcycle.

Paragraph [002] An electronic key system for a vehicle is disclosed, for example, in Japanese Laid-Open Patent Publication No. 2001-349110 and Japanese Laid-Open Patent Publication No. 2001-349117. In the electronic key system for a vehicle disclosed in Japanese Laid-Open Patent Publication No. 2001-349110 and Japanese Laid-Open Patent Publication No. 2001-349117, starting means (switches) are provided on a door handle and a trunk lid of an actual vehicle. If a user operates (starts) any of the starting means, then communication of a control apparatus with an electronic key ~~is started~~ begins. Then, the control apparatus verifies an ID transmitted thereto from the electronic key with an ID registered therein. Thus, if ~~a result of the verifying~~ it is verified that the IDs are coincident with each other ~~is obtained~~, then ~~door locking~~ the doors are unlocked and so forth ~~are cancelled~~.

Paragraph [003] Further, in Japanese Laid-Open Patent Publication No. 2001-349110 and Japanese Laid-Open Patent Publication No. 2001-349117 described above, a starting means (switch) is

provided also on an ignition ~~knob~~ switch. If the user operates the ignition ~~knob~~ switch after the user gets on the four-wheeled car, then the communication between the electronic key and the starting means is performed again to perform ID verifying for permitting starting of the engine. Then, if ~~a result of the verifying~~ it is verified that the IDs are coincident with each other, the engine is started.

Paragraph [004] In particular, in the conventional vehicle electronic key system for a four-wheeled car, the electronic key ~~has a function for unlocking~~ functions both to unlock a door and ~~a function for permitting~~ to permit starting of an engine.

Paragraph [007] Incidentally, in order to apply such an electronic key system to a motorcycle, at least when a user gets on and ~~operates~~ activates the ~~actual~~ vehicle and when the user ~~is running with the actual~~ operates the vehicle, it is necessary for the user to communicate with certainty with the electronic key carried by the user.

Paragraph [008] Particularly in a motorcycle such as a scooter wherein a helmet can be accommodated or stored in a space provided under a seat, it is necessary ~~to perform communication of~~ that the control apparatus communicates with the electronic key with certainty. This applies not only when the user gets on and operates the ~~actual~~ vehicle and when the user is ~~running~~ traveling with the ~~actual~~ vehicle, but also upon opening or closing ~~operation~~ of the seat and when the electronic key is accommodated in the helmet ~~accommodating~~ storage space.

Paragraph [009] Particularly where the vehicle is a motorcycle of a large size, in order to achieve communication of the control apparatus with the electronic key in all of the situations described above,

it is necessary to install a plurality of transmitting antennas at different locations such as a front portion and a rear portion of the actual vehicle. This may ~~possibly invite~~ increase of the cost and the weight of the electronic key system and the installation space required for the electronic key system.

Paragraph [010] In a motorcycle such as a scooter wherein a helmet can be accommodated in a space provided under a seat, such a method as described below is available. In particular, a locking mechanism for locking an opening/closing mechanism of a seat is provided, for example, ~~for the object of antitheft~~ to prevent theft. Thus, if a legal user is recognized through communication of a control apparatus with an electronic key, then the ~~locked state of the~~ seat is ~~released~~ unlocked.

Paragraph [011] In such a case as just described, ~~such a manner of use~~ it is possible that an electronic key placed in a bag or the like is accommodated in a helmet ~~accommodating~~ storage space. In such a manner of use as just described, if communication between the control apparatus and the electronic key is interrupted, then there is the possibility that ~~the locked state of~~ the seat cannot be ~~released~~ unlocked, that is, shut-in of ~~a~~ the baggage may occur.

Please amend the section heading following paragraph [011] as follows:

~~DISCLOSURE~~ SUMMARY OF THE INVENTION

Paragraph [012] The present invention has been made ~~in such a subject as~~ in view of the issues described above, and it is an object of the present invention to provide an electronic key system for a vehicle by which communication of a control apparatus with an electronic key in all of the situations described above can be achieved without ~~inviting~~ an increase ~~of~~ in the cost and the weight, or an

increase ~~of~~ in the required installation space, and so forth, of the electronic key system.

Paragraph [013] Another object of the present invention to provide an electronic key system for a vehicle wherein, even if an electronic key is placed in a helmet ~~accommodating~~ storage space, communication of the control apparatus with the electronic key can be performed with certainty, and a so-called shut-in state of a baggage and so forth can be prevented.

Paragraph [014] According to the present invention, an electronic key system for a vehicle which includes a control apparatus mounted on ~~an actual~~ a vehicle and an electronic key for transmitting a response signal in response to receiving of a request signal transmitted from the control apparatus through a transmitting antenna. The electronic key system is configured so ~~is characterized in~~ that the transmitting antenna is installed in the proximity of the center of the ~~actual~~ vehicle.

Paragraph [015] Consequently, a request signal transmitted from the control apparatus is outputted from the location in the proximity of the ~~actual~~ vehicle. Therefore, ~~as the transmitting range, an~~ almost the entire region of the ~~actual~~ vehicle ~~can be covered~~ is included in the transmitting range. As a result, communication of the control apparatus with the electronic key can be performed with certainty when the user gets on and operates the ~~actual~~ vehicle, when the user is ~~running~~ traveling with the ~~actual~~ vehicle, upon an opening or closing operation of the seat and when the electronic key is ~~accommodated~~ stored in a helmet accommodating space. In this instance, since a single transmitting antenna may be installed, communication of the control apparatus with the electronic key in all of the situations described above can be achieved without ~~inviting increase of~~ increasing the cost and the weight of the device, or an~~,~~ increase of the required installation space and so forth.

Paragraph [016] Preferably, the transmitting antenna is installed at a position within a range from an upper portion to a lower portion of the vehicle, and within a range from a point at one fourth to another point at three fourths of a wheel base with reference to the center of a front wheel of the actual vehicle.

Paragraph [017] Particularly where the ~~actual~~ vehicle includes a seat on which a user is to be seated, preferably the transmitting antenna is installed in the proximity of a front portion of the seat.

Paragraph [018] According to the present invention, an electronic key system for a vehicle which includes a control apparatus mounted on ~~an actual~~ a vehicle and an electronic key for transmitting a response signal in response to receiving of a request signal transmitted from the control apparatus through a transmitting antenna[[,]]. ~~characterized in that the~~ The ~~actual~~ vehicle includes a seat provided for opening and closing movement ~~for being seated by a user~~ and a locking apparatus for locking the seat ~~so as not to be~~ which prevents the seat from being opened until unlocking instruction is supplied thereto[[,]]. ~~that the~~ The control apparatus includes means for verifying the response signal, and outputting an unlocking instruction to the locking apparatus when it is discriminated that the response signal is a request from a legal user[[,]]. ~~and that the~~ The transmitting antenna is installed on the seat or in the proximity of the seat.

Paragraph [019] Consequently, a request signal transmitted from the control apparatus is outputted from the seat or a position in the proximity of the seat. Therefore, ~~as the transmitting range,~~ the seat and a region around the seat ~~can be covered~~ are included in the transmitting range of the transmitter. As a result, even if the electronic key is shut in a helmet ~~accommodating~~ storage space,

communication of the control apparatus with the electronic key can be performed with certainty and a so-called shut-in state of ~~a~~ baggage or the like can be avoided.

Paragraph [020] The transmitting antenna may be provided on a left side face of the seat. Normally, the user operates the seat to open or close standing on the left side of the ~~actual~~ vehicle. Therefore, by mounting the transmitting antenna on the left side face of the seat, communication of the control apparatus with the electronic key can be performed with certainty.

Paragraph [021] Where at least a seat handle, which is used to open or close the seat by manual operation, is provided around a rear portion of the seat, the transmitting antenna may be provided on the seat handle.

Paragraph [022] Normally, the seat handle ~~can be assembled later to~~ is mounted on a vehicle body after assembly of the ~~actual~~ vehicle. Therefore, the shape of the vehicle body or the path of wiring lines need not be changed significantly in order to provide the transmitting antenna. In other words, the transmitting antenna can be mounted with a slight design change, and also the cost can be reduced advantageously.

Please amend the section heading following paragraph [042] as follows:

~~BEST MODE FOR CARRYING OUT~~ DETAILED DESCRIPTION OF THE INVENTION

Paragraph [044] Referring to FIG. 1, Each of electronic key systems 10A, 10B according to a first and a second embodiments includes an electronic key 12 ~~for being~~ to be carried by a user and a control

apparatus 14 mounted on ~~an actual~~ a vehicle 100A (refer to FIG. 6) and ~~an actual~~ a vehicle 100B (refer to FIG. 8). ~~As the~~ The electronic key 12~~, a key which~~ has a shape of a key as an outer shape thereof and incorporates an IC chip therein[[,]]. ~~another key which has a~~ Alternatively, electronic key 12 may have the shape of a card as an outer shape thereof and incorporates an IC chip therein[[,]]. ~~and some~~ However, electronic key 12 is not limited to these shapes and other keys are available. Where the electronic key system according to the present invention is principally applied as a key-less system, a key having a shape of a card is used. In the present specification described below, it is assumed that the electronic key 12 has a shape of a card.

Paragraph [045] Referring to FIG. 2, the electronic key 12 has a shape of a card as just described and includes a battery 20, a power supply circuit 22, a CPU 24, a receiving circuit 26 and a transmitting circuit 28 ~~in the inside thereof~~ therein.

Paragraph [047] The CPU 24 executes at least the following two computer programs: ~~(a~~ A request signal verifying means 30 and a response signal generating means 32~~)~~. The request signal verifying means 30 verifies whether or not a signal supplied from the receiving circuit 26 is the request signal Sr. Thus, if the signal supplied is the request signal Sr, the request signal verifying means 30 passes the control to the response signal generating means 32. The response signal generating means 32 reads out ID data recorded in a ROM not shown based on a request from the request signal verifying means 30. Then, the response signal generating means 32 adds an attribute that indicates a response to the ID data and outputs the ID data as transmitting data Dt to the transmitting circuit 28. The transmitting circuit 28 includes a transmitting antenna not shown. The transmitting circuit 28 modulates a carrier wave in accordance with the transmitting data Dt supplied from the CPU 24 and

transmits the modulated wave as a response signal Sa through the transmitting antenna. The frequency of the carrier wave of the response signal Sa ranges from 200 MHz to 500 MHz.

Paragraph [055] A space 142 (helmet ~~accommodating~~ storage space) which can accommodate a helmet not shown is provided under the seat 140 as shown in FIG. 9. Normally, when the user does not ride the vehicle, a helmet is ~~accommodated~~ stored in the space. Further, depending upon the user, ~~a~~ baggage ~~such as a bag~~ may be accommodated in the space 142.

Paragraph [057] Accordingly, ~~as a location for~~ the starting switch 70[[,]] can be located on the seat handle 144, the inside of the seat 140 or the like ~~is available~~. ~~Where~~ When the starting switch 70 is provided on the seat handle 144, preferably the starting switch 70 is provided at a portion of the seat handle 144 which is to be gripped with a hand when the user opens the seat 140. On the other hand, ~~where~~ when the starting switch 70 is provided in the inside of the seat 140, preferably the starting switch 70 is buried at a location corresponding to a portion of the seat 140 with which the user touches when the user opens the seat 140.

Paragraph [058] Consequently, if the user ~~performs an operation to open~~ opens the seat 140 in order to take out the helmet, then the starting switch 70 is operated into an ON state at the same time. As a result, the operability regarding starting of the electronic key system 10 can be improved.

Paragraph [061] The CPU 42 executes at least the following four programs: ~~(a~~ A request signal generating means 80, a request signal verifying means 82, an observing means 84 and a peripheral instruction means 86~~)~~.

Paragraph [064] In the actual vehicle 100A of the first embodiment 10A, as shown in Fig. 6, the transmitting antenna 72 is installed in the proximity of the center of the ~~actual~~ vehicle 100A. As shown in FIGS. 7A and 7B, the transmitting range of the request signal Sr is a spherical range of a radius of 1 to 1.5 m around the transmitting antenna 72 mounted on the ~~actual~~ vehicle 100A (a range indicated by a circle A in FIGS. 7A and 7B). The transmitting range of the request signal Sr is smaller than the transmitting range of the response signal Sa (range of a radius of several meters around the electronic key 12).

Paragraph [065] Accordingly, where it is assumed that the ~~actual~~ vehicle 100A is a scooter wherein a helmet ~~accommodating~~ storage space not shown is installed, for example, under the seat 140 as shown in FIGS. 7A and 7B, communication of the control apparatus with the electronic key 12 ~~can be~~ carried by the user may be performed with certainty when the user gets on and operates the actual vehicle 100A, when the user performs an operation to open the seat 140, when the user is ~~running~~ traveling with the ~~actual~~ vehicle 100A, when the electronic key 12 is accommodated in the helmet ~~accommodating~~ storage space, and in any other case.

Paragraph [066] Here, a line segment (wheel base) 154 interconnecting the center 150a of a front wheel 150 and the center 152a of a rear wheel 152 is assumed. In this instance, a location in the proximity of the ~~actual~~ vehicle 100A is, for example, a position within a range from an upper portion to a lower portion of the ~~actual~~ vehicle 100A, and within a range from a point P1 at one fourth the wheel base 154 to another point P2 at three fourths the wheel base 154, with reference to the center 150a of the front wheel 150. In the ~~actual~~ vehicle 100A, the transmitting antenna 72 is installed in the

proximity of a front portion of the seat 140.

Paragraph [067] Meanwhile, ~~In~~ in the ~~actual~~ vehicle 100B of the second embodiment 10B, as shown in Fig. 8, the transmitting antenna 72 is installed on the seat 140 of the actual vehicle 100B or in the proximity of the seat 140. As shown in FIGS. 10 and 11, the transmitting range of the request signal Sr is a spherical range of a radius of 1 to 1.5 m around the transmitting antenna 72 mounted on the actual vehicle 100B (a range indicated by a circle A in FIGS. 10 and 11). The transmitting range of the request signal Sr is smaller than the transmitting range of the response signal Sa (range of a radius of several meters around the electronic key 12).

Paragraph [068] Accordingly, where it is assumed that the ~~actual~~ vehicle 100B is a scooter wherein the helmet ~~accommodating~~ storage space 142 (refer to FIG. 9) is installed, for example, under the seat 140 as shown in FIGS. 10 and 11, communication of the control apparatus 14 with the electronic key 12 can be carried by the user may be performed with certainty when the user performs an operation to open the seat 140, when the electronic key 12 is accommodated in the helmet ~~accommodating~~ storage space 142, and in some other case.

Paragraph [078] It is to be noted that, if the main switch 62 is ~~operated into an OFF state~~ turned OFF, then the main relay 66 is turned OFF and also the engine stops simultaneously. Then, if a locking operation is performed, for example, if an operation to place the seat 104 or the seat 104 into a locked state is performed, then the verifying operation of the response signal Sa by the control apparatus 14 is stopped. Further, the second driving circuit 54 is placed into an OFF state.

Paragraph [079] Now, processing operation of the electronic key system 10A according to the first embodiment is described with reference to timing charts of FIGS. 12A to 12E. It is to be noted that a request signal Sr is a signal having a pulse string based on request data Dr, and a response signal Sa is a signal having a pulse string based on data including ID data. It is to be noted, however, that, in order to simplify the description, each of the request signal Sr and the response signal Sa is represented as a signal of one pulse in FIGS. 12A to 12E. Since processing operation of the electronic key system 10B according to the second embodiment is almost the same as the processing operation of the first embodiment~~, it omits~~ explanation of the processing operation of the second embodiment has been omitted .

Paragraph [081] ~~Where~~ When the user holds the electronic key 12, the request signal Sr is received through the receiving circuit 26 (refer to FIG. 2) of the electronic key 12. The electronic key 12 transmits a response signal Sa as seen in FIG. 12D in response to the receiving of the request signal Sr (refer to time t3). The response signal Sa is supplied through the receiving circuit 44 (refer to FIG. 3) of the control apparatus 14 to the CPU 42, by which ID data included in the response signal Sa is verified. If it is discriminated that the ID data exhibits coincidence, then the locked state of the handle bar 120 and the seat 140 is cancelled (unlocked) as seen in FIG. 12E through the control apparatus 14 and the first driving circuit 52 (refer to time t4). As a result of the unlocking procedure, steering by the handle bar 120 is enabled, and the seat 140 is slightly raised. Consequently, the user can easily recognize ~~simply~~ that the locked state of the handle bar 120 and the seat 140 has been released. Further, thereupon, the second driving circuit 54 is placed into an ON state.

Paragraph [083] ~~Where~~ When the user holds the electronic key 12, the electronic key 12 transmits

a response signal Sa as seen in FIG. 12D (refer to time t7) in response to the receiving of the request signal Sr in a similar manner as described hereinabove. The response signal Sa is supplied through the receiving circuit 44 of the control apparatus 14 to the CPU 42, by which ID data included in the response signal Sa is verified. If it is discriminated that the ID data exhibits coincidence, then the processing advances to a next step, that is, to a step at which the request signal Sr is outputted after every interval τ of time.

Paragraph [084] After this state, for example, the user is ~~running~~ traveling with the actual vehicle 100A, and during the ~~running~~ travel, the request signal Sr is outputted from the control apparatus 14 after every interval τ of time. In other words, communication of the control apparatus 14 with the electronic key 12 is performed after every interval τ of time, and the electronic key 12 outputs a response signal Sa after every substantially fixed interval τ of time.

Paragraph [085] The processing operation described above is a process after the user, holding the electronic key, gets on and ~~operates~~ activates the ~~actual~~ vehicle 100A until it ~~runs with~~ operates the ~~actual~~ vehicle 100A. Now, a processing operation used when it is detected that the electronic key 12 is absent upon starting of the actual vehicle 100A is described ~~simply~~.

Paragraph [086] First, if the user operates the starting switch 70 into an ON state while it does not hold the electronic key 12, then a request signal Sr is transmitted from the control apparatus 14. However, the control apparatus 14 does not ~~perform perception of~~ perceive a response signal Sa to the request signal Sr outputted therefrom. As a result, the observing means 84 outputs a warning signal Se to the third driving circuit 56. Consequently, the warning lamp 68 is lit. Naturally, in this instance,

such a process as unlocking of the handle bar 120 and the seat 140 or the like is not performed.

Paragraph [087] From the lighting of the warning lamp 68, the user can recognize that ~~it~~ he does not hold the electronic key 12. Consequently, starting of the engine while the electronic key 12 is not held ~~can be~~ is prevented.

Paragraph [088] ~~Subsequently~~ Now, a processing operation for the case when it is determined that the electronic key 12 is not present upon starting of the engine of the actual vehicle 100A is described ~~simply~~.

Paragraph [089] First, if the user ~~operates~~ turns on the starting switch 70 ~~into an ON state~~ while ~~it holds~~ holding the electronic key 12, then a request signal Sr is transmitted from the control apparatus 14, and communication of the control apparatus 14 with the electronic key 12 is started. Through the communication, ID data included in a response signal is verified, and if it is discriminated that the ID data does not exhibit coincidence, then the locked state of the handle bar 120 and the seat 140 is canceled.

Paragraph [090] Then, if the user operates the main switch 62 into an ON state without recognizing that, for example, the electronic key 12 has been dropped, then although a request signal Sr is transmitted from the control apparatus 14, the control apparatus 14 does not ~~perform receiving of~~ receive a response signal Sa to the thus outputted request signal Sr any more. As a result, the observing means 84 outputs a warning signal Se to the third driving circuit 56, and consequently, the warning lamp 68 is lit.

Paragraph [092] Now, a processing operation for the case when it is determined that the electronic key 12 is not present while the ~~actual~~ vehicle 100A is running is described briefly.

Paragraph [094] When the engine starts in response to the ON-operation of the main switch 62, the processing advances to a step at which a request signal Sr is outputted after every interval τ of time as described hereinabove. After this stage, the user is, for example, ~~running~~ traveling with the actual vehicle 100A, and during the ~~running~~ travel, a request signal Sr is outputted from the control apparatus 14 after every interval τ of time.

Paragraph [095] If, for example, the electronic key 12 drops during ~~running with~~ travel of the ~~actual~~ vehicle 100A, then ~~receiving of~~ a response signal Sa is no longer received by the control apparatus 14 ~~is not performed any more~~. When a response signal Sa is not received within a predetermined interval of time after the point of time at which the request data Dr is outputted, the observing means 84 increments the count value by +1 to update it. At a point of time when the count value exceeds a predetermined value while a request signal Sr is successively outputted, the observing means 84 outputs a warning signal Se to the third driving circuit 56. Consequently, the warning lamp 68 is lit.

Paragraph [098] Consequently, ~~as the transmitting range,~~ a substantially overall region of the actual vehicle 100A ~~can be covered~~ is included in the transmitting range. As a result, communication of the control apparatus 14 with the electronic key 12 can be performed with certainty when the user gets on and ~~operates~~ ~~activates~~ the ~~actual~~ vehicle 100A, when the user is ~~running with~~ operating the

~~actual~~ vehicle 100A, upon opening or closing operation of the seat 140 and when the electronic key 12 is accommodated in the helmet ~~accommodating~~ storage space. In this instance, since the single transmitting antenna 72 may be installed, communication of the control apparatus 14 with the electronic key 12 in all of the situations described above can be achieved without ~~inviting increase of~~ increasing the cost and the weight, ~~increase of~~ or increasing the required installation space and so forth.

Paragraph [099] Further, a bag in which the electronic key 12 is placed is sometimes accommodated in the helmet ~~accommodating~~ storage space provided under the seat 140. Also in this instance, however, communication between the control apparatus 14 and the electronic key 12 is performed with certainty. Consequently, a so-called shut-in state (a state wherein the seat 140 cannot be unlocked while the electronic key 12 remains accommodated in the helmet accommodating space) can be prevented.

Paragraph [100] In the electronic key system 10B according to the second embodiment, the transmitting antenna 72 of the control apparatus 14 is installed on the seat 140 or the seat handle 144 of the ~~actual~~ vehicle 100B. Therefore, the request signal Sr transmitted from the control apparatus 14 is outputted from the seat 140 or the seat handle 144. Consequently, ~~as the transmitting range,~~ the seat 140 and a region around the seat 140 ~~can be covered~~ are included in the transmitting range. As a result, communication of the control apparatus 14 with the electronic key 12 can be performed with certainty even if the electronic key 12 is placed in the helmet ~~accommodating~~ storage space 142, and a so-called shut-in state of a baggage or the like can be prevented.

Paragraph [101] Normally, the user ~~operates~~ opens or closes the seat 140 ~~to open or close~~ while

standing on the left side of the actual vehicle 100B. Therefore, by mounting the transmitting antenna 72 on the left side face of the seat 140, communication of the control apparatus 14 with the electronic key 12 upon an operation to open or close the seat 140 can be performed with certainty.

Paragraph [111] ~~Which~~ The selection of which one of the electronic key systems 10A to 10F according to the first to the sixth embodiments described above should be ~~selectively~~ determined by taking into consideration the size of the actual vehicles 100A to 100F, the paths of the wiring lines, the installation space for the transmitting antenna 72 and so ~~forth into consideration~~.